NON-SURGICAL CAUSES OF ACUTE ABDOMINAL PAIN

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The simulation of an acute surgical lesion in the abdomen by a medical condition is not uncommon. Tabes dorsalis, plumbism, herpes zoster, spondylitis, and coronary occlusion are examples of common medical conditions which not infrequently present abdominal symptoms closely resembling those of acute appendicitis, ruptured ulcer, or calculous cholecystitis. The abdomen has repeatedly been opened and no pathological lesion found, while, at a later date, laboratory evidence of diabetic acidosis or of plumbism was returned. The surgeon or internist must be alert to the possibilities applying to his particular case before subjecting a patient with atypical abdominal findings to an unnecessary exploratory laparotomy. Practically no abdominal condition is such an emergency as to preclude a white blood count and urinalysis (sugar, albumin, and microscopical).

A classification of the medical conditions causing acute abdominal pain, which may, on occasions, be confused with surgical entities, is presented below. Such a list is not all inclusive, nor does it contain those conditions which usually lead to surgical intervention at a later date (*e.g.,* stone in the genito-urinary tract, biliary colic, *etc.*).

Non-surgical Causes of Acute Abdominal Pain:

(1) Metabolic
  (a) Diabetic acidosis.
  (b) Tetany.

(2) Cardiovascular
  (a) Referred from the heart (angina pectoris, coronary occlusion, pericarditis).
  (b) Embolism and thrombosis (mesenteric occlusion, subacute bacterial endocarditis, polycythemia).
  (c) Intra-abdominal arterial disease (periarteritis nodosa, dissecting aneurism, abdominal angina).

(3) Hæmatologic
  (a) Hæmolytic icterus.
  (b) Purpura (Henoch, Osler).
  (c) Sickle-cell anæmia.
  (d) Splenic enlargements with perisplenitis or infarction (leukemia, Banti's disease, Hodgkin's disease, *etc.*).

(4) Infectious
  (a) Occasionally at onset of acute infections (influenza, typhoid and paratyphoid fevers, poliomyelitis, malaria, acute tonsillitis).

(b) Dysentery (amœbic, bacillary).
(c) Rheumatic peritonitis.
(d) Tabetic crises.
(e) Arachnoidism.

(5) Gastro-intestinal
(a) Cholangitis.
(b) Acute gastro-enteritis (foods, heavy metals, acids, alkalis, *etc.*).
(c) Pylorospasm.
(d) Intestinal parasites.

(6) Genito-urinary
(a) Dietl's crises.
(b) Pyelitis.
(c) Distended urinary bladder.

(7) Pulmonary
(a) Pleurisy.
(b) Pneumonia in children.

(8) Abdominal-wall disorders
(a) Early herpes zoster.
(b) Intercostal neuralgia.
(c) Trichiniasis.
(d) Trauma.

(9) Hysteria and malingering

METABOLIC.—Acidosis is not infrequently associated with acute abdominal distress resembling the picture of acute appendicitis. In differentiating these two conditions symptomatically, a finding of importance is the fact that in diabetic acidosis the vomiting usually precedes the occurrence of abdominal pain, while in appendicitis the reverse is usually the case. Both diabetic acidosis and acute appendicitis may exhibit abdominal pain, fever, and leucocytosis. A white blood count of 25,000 or more is common in acidosis. Rabinowitch[1] states that in children, particularly, it may reach 75,000 or more. If there is a definite intra-abdominal lesion present causing pain, it will persist or increase in spite of treatment for the acidosis. Acute appendicitis and diabetic acidosis may, of course, occur together; the safest procedure under such circumstances is to institute insulin therapy and operate at once. An example of the simulation of acute appendicitis by diabetic acidosis is seen in the following case:

CASE I.—A fifteen-year-old Jewish girl was admitted to the surgical service of the University Hospital with a diagnosis of acute appendicitis. The history was that at 2 A.M. of the day of admission the patient was awakened by a diffuse pulmonary pain and a feeling of constriction in the chest. Following a bowel movement, the pain seemed to migrate from the chest and settle in the abdomen. The abdominal distress was quite severe from its onset. She was nauseated and vomited twice. On admission to the hospital that evening, there was considerable nausea, and severe pain in the right lower quadrant of the abdomen.

Physical examination revealed a T.P.R. of 100.4°, 160, 36. The patient seemed to be acutely ill, but was quite well nourished. Examination of the heart and lungs was negative; the abdomen presented a generalized rigidity, somewhat more marked on the right

side, together with right lower quadrant tenderness. Peristaltic sounds were somewhat less than normal. Liver, spleen, and kidneys were not palpable.

A tentative diagnosis of acute appendicitis was made. Laboratory data revealed a white blood count of 26,000, 91 per cent. of which were neutrophiles. Red blood count was 5,400,000 per cubic millimetres and hæmoglobin was 110 per cent. Urinalysis showed a trace of albumin, and four plus sugar, acetone, and diacetic acid. The patient was transferred to the medical wards with a diagnosis of diabetic acidosis. At this time, additional careful questioning of the family revealed a history of recent loss of appetite and weight.

Within several hours after the institution of a diabetic régime, the abdominal distress had entirely disappeared. It is noteworthy that the white blood count twenty-four hours after admission was 24,000, and seventy-two hours later, 15,400; five days after admission the white blood count had returned to normal, and the false polycythemia of dehydration had disappeared, the red cells dropping to 4,400,000 and the hæmoglobin to 78 per cent. The patient pursued an uneventful convalescence and left the hospital with her diabetic state well regulated, and free of any abdominal distress.

The occurrence of abdominal pain and distress in tetany is not well recognized. The condition is infrequent, but must be borne in mind. Abdominal pain and rigidity have been so pronounced in tetany as to lead to operative intervention for a suspected ruptured ulcer.[2] The following patient with abdominal pain resulting from tetany was seen in the medical wards:

CASE II.—D. M., an Italian male of thirty-eight years, was admitted to the surgical wards of the University Hospital with a diagnosis of duodenal ulcer, with possible perforation. The patient's history contained periods of diarrhœa during childhood, a progressive weakness for the past three years, and abdominal pains for one and a half years. These were in the nature of hunger sensations localized just beneath the lower end of the sternum. For the six months previous to admission there were periods of relief from pain, each lasting one to two weeks. Food at times gave marked relief; soda was never tried. Fried foods or meats aggravated this distress. There was no pyrosis, nausea, vomiting, or hæmatemesis. The patient had lost 12 per cent. of his weight in the past three years. The only additional symptom was a sensation of pins and needles in the extremities.

Physical examination revealed no abnormalities. Liver, kidneys, and spleen were not palpable. The epigastrium was moderately tender, and a slight amount of rigidity was noted. Following subsidence of the acute symptoms, gastro-intestinal X-ray revealed a peculiar pooling throughout the small intestine, with marked dilatation of the jejunum and probably most of the ileum, plus loss of the valvulæ conniventes in the jejunum; many fluid levels were noted. Dr. Henry K. Pancoast reported that he had never before seen a similar picture.

The patient was transferred to the medical wards, where it was accidentally discovered, during a blood-pressure estimation, that the patient's hand assumed an obstetrical position. A blood calcium estimation was 6 milligrams per cent. All of the other characteristic signs of tetany were then found. A diagnosis of chronic idiopathic adult tetany was made. Marked subjective and objective improvement followed administration of large doses of calcium orally.

CARDIOVASCULAR.—The frequent causation of abdominal symptoms by cardiac pathology is well known. The occurrence of severe pain, limited to the epigastrium, due to coronary occlusion, is with difficulty at times differentiated from an upper abdominal catastrophe. The introduction of the direct anteroposterior chest leads[3] in the electrocardiogram has been of much assistance under such circumstances. Abdominal operations have been performed because of the simulation of acute appendicitis or an acute surgical condition

of the kidney or gall-bladder by periarteritis nodosa.[4] Klein and Owen[5] emphasize the great variability of symptoms, with the most common being a septic fever, polyneuritis, polymyositis, hæmaturia or nephritis, abdominal cramp-like pains, and progressive emaciation. The gastro-intestinal symptoms may include cramps, colic, sensitivity to palpation of the abdomen, signs of peritoneal irritation, loss of appetite, vomiting, diarrhœa or constipation, and bleeding from the gastro-intestinal tract. Acute abdominal distress is not uncommon in subacute bacterial endocarditis. Sharp left upper quadrant pain during the course of this disease may follow splenic infarction with the subsequent development of perisplenitis, producing a definite friction rub. Small infarcts may occur throughout the intestinal tract, producing occult, or, at times, visible blood in the stools. The simulation of an acute surgical condition in the abdomen by a hemopericardium is recorded below.

CASE III.—C. H., a white male of fifty-one years, was admitted to the surgical wards of the University Hospital with a diagnosis of ruptured duodenal ulcer with terminal peritonitis. The patient had complained of slight abdominal discomfort for several days previous to the onset of an intense epigastric pain. On examination, the upper abdomen presented a board-like rigidity with extreme tenderness throughout. However, the cervical veins were quite dilated, the lips and fingertips cyanotic, and the heart sounds quite distant. X-ray revealed a huge pericardial effusion, which was tapped, 900 cubic centimetres of almost pure blood being removed at the first tapping, and 600 cubic centimetres several days later, with almost immediate relief of symptoms. When relaxed, the upper abdominal rigidity proved to be a hugely distended liver. The patient made an uneventful recovery and is well two years following the incident.

HEMATOLOGIC.—A sense of weight or of dragging abdominal pain is often the first sign of an enlarged spleen in leukæmia, Banti's disease, Hodgkin's disease, amyloidosis, or late lues. The development of a perisplenitis or infarct in any of these conditions may lead to acute upper abdominal pain. The enlarged spleen is sometimes painful and sensitive to pressure, and may be associated with spasm of the overlying muscles. Attacks of abdominal pain in hæmolytic icterus are attributed to crises of deglobulization; it must, however, be remembered that cholelithiasis occurs in over half of these cases.

Periodic crises of severe abdominal pain simulating surgical conditions have been reported in sickle-cell anæmia.[6] These are general or local in character and are usually accompanied by fever. The following case, illustrating this condition, was seen in the medical wards:

CASE IV.—H. C., aged twenty-one years, a colored female, was admitted with a chief complaint of aching bilateral lower abdominal pain. Since her marriage two years previously, the patient noticed this discomfort for the first two days of each menstrual period. Four days after the onset of her last period, the patient had a very severe attack of pain and was sent to the hospital. For the last several years the patient had lacked vigor and had tired quite easily. She had lost 15 per cent. of her body weight in this period. There had been some dyspnœa on exertion and slight ankle œdema for the past year. For the past two months a small traumatic ulcer had persisted on the left ankle.

Physical examination (T.P.R. 98°, 110, 28) revealed a fairly well-developed colored girl, with a distended abdomen and marked abdominal rigidity. A surgical consultation offered the diagnosis of pelvic inflammatory disease, with a suggestion that palliative treatment be followed. Gynecological consultant found no pelvic pathology. The fol-

lowing day, the temperature rose to 101°, and remained between 99.5° and 102.5° for a week. Complete blood count was as follows: red blood-cells, 3,800,000; white blood-cells, 26,000; haemoglobin, 60 per cent.; neutrophiles, 81 per cent.; lymphocytes, 6 per cent.; monocytes, 7 per cent.; eosinophiles, 4 per cent., and myelocytes, 2 per cent. Marked sickling of the red blood-cells was seen by the appropriate preparation. Van den Bergh reaction showed a delayed direct and an indirect reading of 2.1 units. Urinalysis and blood Wassermann reactions were negative. Cell volume index was 0.96; fragility test, platelets, and reticulocytes were normal. A diagnosis of sickle-cell anæmia was made. Gastro-intestinal studies proved to be entirely negative.

Severe abdominal pain may occur in purpura, as described by Henoch, and is sometimes associated with allergic skin eruptions. In describing this latter group, Osler[7] reported twenty-nine cases in which there were purpuric manifestations together with colicky abdominal pain. The skin manifestations included purpura, urticaria, angioneurotic œdema, and erythema. Fifty per cent. of the cases had fever, and practically all had severe colicky abdominal pain. A case falling into this group was recently diagnosed in the University Hospital by Dr. O. H. Perry Pepper, and is reported below.

CASE V.—A. M., a white male aged thirty-one years, was admitted to the medical wards of the University Hospital complaining of terrific left-sided abdominal pain. The onset of the patient's illness dated back one year. At that time, an abrupt severe abdominal pain caused the patient to double up. There was no nausea or vomiting. The pain was confined to a small area just to the left of the umbilicus, and did not radiate. The pain was present constantly for ten days. The patient noticed that his skin appeared "green" and that his urine assumed a red or black color. A physician found albumin and blood in the urine. At the end of ten days the pain and jaundice abruptly disappeared. Four or five such attacks occurred at intervals during the year before admission. The only additional positive fact in the history was the occurrence of an urticaria which was usually coincident with the attacks of abdominal pain.

Physical examination revealed many urticarial wheals over the skin of the chest. There was marked tenderness just above and to the left of the umbilicus with no hyperesthesia. There was no costovertebral tenderness. Moderate rigidity was observed in the left upper abdomen.

Blood count showed a moderate secondary anæmia with a slight neutrophilic leucocytosis. Urine contained an abundant amount of albumin, with many granular and hyaline casts. Phenolsulphonephthalein showed an elimination of 50 per cent. of the dye in two hours. Blood urea nitrogen was 21 milligrams per cent. Van den Bergh was normal. Gastric analysis showed a slight excess of free and total acid. Biliary drainage revealed many calcium billirubinate crystals. Complete blood studies disclosed the following: reticulocytes, 15 per cent.; clot retraction, normal; venous coagulation time, thirty-seven minutes; cell volume index, 0.96; fragility test, normal; platelets, 64,000. Blood and spinal fluid Wassermann tests were negative. Later examinations revealed an increasing degree of secondary anæmia and a hæmaturia.

An intravenous urogram showed perfectly functioning and seemingly normal kidneys. Urea clearance was 43 per cent. of average normal function. Cystoscopy was negative, and ureteral dilatation failed to reproduce the pain. A flat plate of the abdomen was negative. Examination of the urine for tubercle bacilli and guinea-pig inoculation were negative. Blood cultures were negative.

During his stay in the hospital, the patient's temperature varied between 100° and 102°, with a commensurate elevation of the pulse. The patient died shortly after admission. Autopsy showed cloudy swelling of the kidneys with submucous hæmorrhages of the renal pelves, multiple cerebral hæmorrhages, some fatty degeneration of the liver, follicular splenitis, and a negative bladder, prostate, and ureters.

INFECTIONS.—It is beyond the scope of this short discussion to detail the abdominal picture in acute infections. However, the onset of many acute infectious diseases is often accompanied by severe abdominal distress and occasionally by nausea and vomiting. It must also be remembered that a surgical emergency, as appendicitis, may occur during the course of an acute infection (*e.g.*, tonsillitis). Acute rheumatic fever is of especial importance in this connection because acute abdominal pain and signs of peritoneal irritation may appear during the course of an attack. The general reaction is severe with a high fever and leucocytosis, and the abdominal phenomena are often more diffuse than in appendicitis. Localization to the right lower quadrant is less apt to occur. If operation is performed, one may find clear fluid in the abdomen and hyperæmia, œdema, and infiltration of the peritoneal and subperitoneal tissues.[8]

In tropical regions, acute abdominal malaria has been confused with surgical abdominal catastrophes. Taylor[9] has pointed out that although nausea, vomiting, abdominal pain, and fever are not uncommon in abdominal malaria, distinguishing the latter from acute surgical conditions of the abdomen rests principally upon the absence of abdominal rigidity and a positive test for occult blood in the vomitus or gastric contents.

Arachnoidism, or disease due to poisonous spider bites, is becoming increasingly more frequent. Numerous surgeons have subjected patients to the additional trauma of a major surgical operation because of faulty diagnosis and confusion with acute surgical conditions.[10] Muscle pains, beginning in the region of the bite, rapidly spread throughout the body, and are usually felt most intensely in the abdominal muscles. Rigidity and muscle spasm may become so marked that the abdomen is actually board-like. This rigidity is not confined, however, to the muscles of the abdomen, and true local tenderness is usually absent.

Acute anterior poliomyelitis in children is not infrequently associated with acute abdominal pain, nausea and vomiting, so that the clinical picture has been mistaken for acute appendicitis. The recent outbreak of amœbiasis (amœbic dysentery) has led to occasional unfortunate laparotomies because of faulty diagnosis. This disease may be so mild that vague abdominal pain and indigestion may be the only symptoms for months. In other cases, there may be sudden colicky abdominal pain with abdominal tenderness and fever (100°–102°). Apart from the presence of amœbæ, the stools are not characteristic. Absolute diagnosis can be made only by recognizing the motile amœbæ or their cysts in the stool; typical organisms are most often found in preparations made from material taken directly from the bowel ulcerations through a sigmoidoscope.

GASTRO-INTESTINAL.—Most of the conditions enumerated above under this heading are easily recognized. The vomiting and crampy abdominal pains sometimes seen in trichiniasis may simulate a surgical abdomen. The pains are often due to encysted larvæ in the abdominal muscles or diaphragm. A gastroenteritis may occur immediately following the consumption of pork infested with the trichinæ; in most instances, however, there is an incubation

period of from five to twenty days. The onset is usually sudden, and intestinal hæmorrhage has been noted occasionally.

Severe localized or general abdominal pain may be incident to metallic poisonings; abdominal rigidity is also usually a feature. In these cases, a history of poisoning is usually available. More difficult to distinguish from a surgical lesion are the severe, crampy, peri-umbilical pains which may occur in plumbism, sometimes many months after all exposure to lead has ceased.

CONCLUSIONS

Accurate diagnosis of pathological conditions of any abdominal organ is in most instances not possible from the pain alone. This follows in part from the fact that the abdominal organs themselves are devoid of pain sensations, and that pain caused by disease of them is usually propagated to an area other than that in which it is produced. The coverings of the abdominal organs, their ducts and blood-vessels can, however, give rise to pain sensations.

The examination of the blood, urine, and often of the fæces, together with the temperature, pulse, and respiratory rate, are important factors in determining the etiology of abdominal pain. Pain as an isolated symptom is not a reliable diagnostic criterion, but becomes quite valuable in association with other findings.

SUMMARY

(1) A classification of some of the non-surgical causes of acute abdominal pain has been attempted.

(2) Case reports illustrating several of the more uncommon of these are included.

(3) The abdominal pictures of some of the less well known are briefly reviewed.

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